to get him to walk with his feet perfectly straight and will put a little raise in the shoe or get a Goldwaithe plate made for him. The plate and screws are still on the bone. He is walking now, the little swelling that he still has almost disappears in the morning.

The Immobilization of Fractures.

By S. J. HUNKIN, M. D.

It seems to me that there are three things to be considered in the handling of fractures: (1) That the alignment must be maintained; (2) that the fragments must be in contact and end to end, and (3) that the immobilization must be maintained at all times. It has fallen to my lot many times during the last year, and twice during the past week, to see fractures in which surgical operative procedures had been adopted with good placement of wire and staples, and yet the surgeon, notwithstanding his good operative technic, had failed to obtain immobilization and consequently, union. In one instance the fracture was of the upper third of the femur; in this instance after the placement of the staples, the man was put into bed without any immobilization whatever and lay there several weeks. Later on some bowing was noticed and traction was applied. The fracture occurred about nine months ago and the man is still in bed.

The other case is that of a man who was hurt in a runaway. There was a fracture of the femur at the junction of the middle and upper thirds. It was wired and healed by first intention. A plaster of Paris splint had been applied in such a manner that the upper edge of it extended only 12 cm. above the line of fracture while about nine or ten pounds of the splint extended below the fracture and yet the surgeon wondered why he had not secured union.

Contact between the fragments must be obtained and maintained with some pressure. There is an axiom in surgery regarding immobilization of fractures the essence of which is that, not only the fragments shall be held steadily in contact but also the joint above and the joint below the fracture shall be immobilized. That such an axiom is of the utmost importance there can be no doubt, and yet in the large majority of the fractures which I see this axiom is entirely disregarded. Indeed it is unusual to see a fracture held with the joints above and below absolutely fixed. I am familiar with the work of Championierre who treats fractures without any splint. Concerning his method I have little to say except that the results which he obtains would not be satisfactory to me and would, I believe, in this country lead to malpractice suits. With regard to the part played by splints applied directly to the bone. It does not make any particular difference what the bone is splinted with. I prefer staples for fractures occurring in the vicinity of joints and plates for fractures occurring in the shafts of bones.

Up to the present time I think I have at least twenty-five plates in; of these two have little sinuses which will probably require the removal of the plate later on. I am in the habit of using a plate which is much stronger than the ones shown here and I like to have these plates made for each individual case. I am using much longer plates than I did formerly which allows the screw-holes to be placed farther apart, which is an advantage, and the screws are countersunk. The bone-plate has little purpose, though, except to keep the ends of the fragment in contact; it does not maintain alignment after the first few days, because at the end of this time the screws are loosened to a greater or less extent; but it does maintain the fragments end to end even if the alignment is lost; obviously the maintaining of fragments end to end accomplishes by far too little because such a condition permits of the fragments being adducted, abducted, flexed, extended and rotated. To obviate this I am in the habit of applying two plates in the fractures of long bones. The plates are applied longitudinally and ninety degrees apart, a procedure which is, mechanically, most efficient because, when so applied, inter-fragmentary motion is reduced to a minimum.

It is also evident that immobilization cannot be best maintained by traction but that traction may be of value as an aid in maintaining immobilization. For the external splint some substance should be used from which a mold of the leg could be made. Dr. Sherman made such a splint from iron-wire which was more efficient than any other I know of, because it was so constructed as to fit the changing contours of the body. It is very difficult to properly pad and accurately apply a wooden splint to fractures of the femur. I am particularly well satisfied with plaster of paris. A splint for a fracture of the femur should extend from the toes to the ribs, the foot being included to prevent rotation of the fragments, and when so applied the joint above and the joint below the fracture are held. Such a splint, together with the bone-plates, allows the patient to be moved about and to be turned over without any danger of disturbing the fragments.

Discussion.

Dr. Stanley Stillman, San Francisco: So far as Dr. Huntington's paper is concerned, I must say that I concur with every statement which he has made. The question whether all recent fractures should be submitted to operation or open treatment seems to me, particularly of late years, to have become analogous to the question of the treatment of an inflamed appendix. The whole medical world is now practically agreed in regard to appendix and gall-bladder treatment. So far as fractures are concerned, Dr. Huntington has stated all the essential points. I do not mean to say that every appendix should be operated upon nor every case of fracture, but where there is some obstacle to reduction or difficulty of retention particularly in a case involving a joint, I regard operation as imperative.

My own attitude in these cases is shown when I say that I state to a patient that I decline to take a fracture case unless I am given the privilege of operating if I see fit to do so. My own experience with operative treatment of recent fractures is less than that of Drs. Huntington and Hunkin, but my experience of later cases has been very considerable. There is a great difference between the ease with which you can restore the anatomical relations in recent fractures as compared with the difficulty you encounter in figuring out the articular or fractured surfaces of fragments which have been out of place for some weeks. When the fragment is partially buried in callus it is a very difficult thing so to remove the callus as to permit of accurate replacement. The time to operate on these cases is shortly after the accident happens; the fragments can be fitted back into place again and the results in fractures involving the joints are excellent provided you get anatomical replacement of parts. If this replacement is not accomplished, the result will be an impaired joint no matter what you do except perhaps in the case of young children where sometimes remarkable function is obtained in spite of

great deformity. I agree with Dr. Huntington again in that more is to be expected of us in the future in the results of the treatment of fractures, and that an X-ray picture of a case after reduction whether operated or not, is of the greatest importance. Dr. Russell's case is a striking example of what immediate operation of fractures will do. If he had treated the case six or eight weeks in the usual way before operating, he would not have gotten this result, nor would any other surgeon have succeeded in getting the result which he has shown here.

So far as Dr. Hunkin's paper is concerned, I do not think that I have anything further to add. I am surprised at his statement that he has found it the rule that physicians in applying splints, leave out the neighboring joints in fractures of the limbs. I know that in my own teaching, I have always taught that in a fracture of the arm, splints should take in both elbow and shoulder; in a fracture of the femur. splints should take in the knee and the pelvis, etc. Dr. Hunkin's statement that no interosseous splint will maintain a fracture in apposition for any length of time without external support, is true and applies to bone as well as muscle, tendon or any other structure. There is no use in attempting to hold two tissues together when there is tension enough to cause the suture material to cut and any interosseous splint should be supplemented by suitable external support.

The great question before us to-night is whether this Academy wishes to proclaim its assent to the proposition that practically all cases of fracture ought to be treated by operation. For my part I think they should, not because it is not possible in most cases to get good results in any case without, but because better results can be gotten with operation. The additional damage done by the surgeon is very little and the risk of infection not great enough with proper technic, to balance the advantage gained by the accurate replacement and retention of the fragments. When, however, the X-ray pictures show that satisfactory reduction has been accomplished, then of course such interference is not called for.

Dr. Rixford: I am perfectly in accord with the views expressed by the last speaker as to the general notions of the operative treatment of fractures. There can be no doubt that if a fracture is sooner or later to be reduced by open incision it is vastly better to operate while the fracture is still recent rather than to operate only after a poor result has been obtained by non-operative methods. The reasons for this are obvious. Shortening or longitudinal displacement is readily overcome; the bone is better nourished not having suffered the atrophy of disuse; the general physical condition of the patient is better; his period of confinement is less and nonunion is much less likely to occur than where operation is performed as a secondary procedure. Reduction and retention in splints is still a legitimate treatment, however, and I believe preferable for the majority of fracture cases. It therefore would seem to be important in our first study of fractures to determine whether the given case may be better treated by operative or non-operative methods. In certain groups of cases the decision is not difficult; e. g., the great majority of the fractures of the short bones may be satisfactorily managed without operation; simple transverse fracture of the shafts of the long bones also; but spiral fractures of the shafts of long bones (and this is a much larger class than commonly stated, comprising as it does, most of the oblique fractures) may be best treated by open incision. Spiral fractures are caused by twists and the direction of the spiral is always the same as that of the twist—a right hand twist will produce a right handed spiral fracture (the line of fracture corresponding to the thread of a right handed screw). Since right handed twists are more commonly received by the left leg, spiral fractures of the left leg are most commonly right handed spirals and vice versa, left handed spiral fractures are most common in the right leg. In these spiral fractures the ends of the fragments are irregular, they have sharp points which cut into and hook into soft parts; they are difficult of adjustment because adjustment to be at all satisfactory must be absolutely perfect; and that is impossible except through an open incision. They present no square shoulders which after reduction will take up the longitudinal pull of the muscles. Comminution is often present. In these and similar fractures if adjustment be made by early operation the difficulties encountered will be a minimum and the pieces will fit perfectly. In late operation rarefying osteitis and deposit of new bone so change the shape of the fragments as to make adjustment uncertain and imperfect. Shortening may be obstinate or irremediable and union in mal-position may necessitate mortising of the bone with permanent shortening.

In my own work I am guided as to the indications for operation very much by X-ray findings—I am almost ready to say that I refuse to take the responsibility of a fracture case unless I can have one or more radiographs taken. The radiograph taken before treatment is instituted is a record which is of value not only in anatomical diagnosis and in estimating the indications for operation and in prognosis but is valuable also for future reference and in forestalling malpractice suits. A radiograph taken after adjustment of the fragments—preferably taken through the splints or plaster dressing—is a splendid check on the efficiency of the procedures adopted.

In my personal work I have had a very considerable experience in the operative treatment of fractures. It has been confined, however, almost entirely to the use of wire and the staples of Arbuthnot Lane which I first saw Dr. Huntington use. With the Parkhill clamp and the Sich and other plates I have had little or no experience. I believe, however, from my observation that the simpler the device the better and that the great majority of fractures requiring operation can be better held by means of simple wires, staples or nails than by these more complicated appliances. The real essential, however, is that the operator shall have a goodly measure of mechanical ingenuity—if he is lacking in that particular he had best not bother with the operative treatment of fractures. As between staples and wire, I believe the wire to be the more generally useful.

This radiograph (plate exhibited) shows a complicated spiral fracture of the lower end of the tibia beautifully adjusted and held in place by one of the Lane Staples. But the radiograph took this other plate at right angles which shows that the staple had swung around on its two ends permitting an antero-posterior displacement great enough to spoil the result. I show the picture as an example of one source of failure of the staple. I may say that a wire judiciously placed, subsequently held the fragments in perfect position.

I often use both staple and wire—wire to hold the fragments in lateral apposition and to prevent rotation and staple to prevent longitudinal displacement. Sometimes it is sufficient to simply put the wire around the bone and in this I believe wire is superior to a metal ferrule but if the bone is strong enough, I believe it is better to pass the wire through drill holes whereby if the holes be properly placed advantage is gained in resisting the forces which tend toward displacement.

It was held not very long ago that a limb once shortened could not be lengthened but it is found that not infrequently a shortening of one, two or even more inches which has existed for a considerable number of weeks may be overcome if you have a good husky man or two or suitable mechanical appliances which will pull out the limb after release of the fractured ends of bone. I have succeeded in this way of overcoming a shortening of the leg of two inches after six weeks, in another, a shortening of one and one-half inches after four months,

and a shortening of a thigh of 2½ inches after four weeks.

As a rule I prefer to operate when the fracture is several days' old—a week or so—and for the following reasons: there is less swelling, less hemorrhage in the operation, less tissue present of doubtful vitality; healing has already begun, granulation cells or round celled infiltration have begun to form in the part by which the danger of infection is greatly lessened; or as an old time practitioner put it "The cells of healing are in the part"; there is time for the healing of abrasions to have occurred; delirium tremens is apt to have been overcome and there is nothing lost either in mechanical conditions looking to the adjustment of the fragments nor in the time of recovery of the patient.

Dr. Rixford exhibited a number of radiographs of fractures of the leg, thigh and arm adjusted through the open incision and held by wires and staples. As an example of the kind of case which is every now and then put up to the surgeon he showed a plate of a humerus fractured in two places 2½ inches apart; the uppermost fragment shattered, and the lowest split into the elbow joint. The uppermost fragment had penetrated the skin and had cut off the ulnar nerve. The condition present was that of non-union of the lower of the two principal fractures, anchylosis of the elbow and complete muscle-spiral paralysis. Operation showed the nerve ends separated about three inches—stretching gained about three-fourths of an inch. Since the restoration of nerve function is paramount and nerves recover much more completely when the freshened ends are in complete contact, it seems best to shorten the humerus 2½ inches or enough to permit of approximation of the trimmed nerve ends without tension. At date of publication (after four weeks) excellent union of the bone has occurred.

Dr. Harry M. Sherman: I think that we ought to emphasize the point made by Dr. Hunkin about the intra bone splint being merely a coaptation suture. What he has said, too, about the inadequacy of splints we all see, especially in cases from the country, plaster of paris being rarely used for these purposes, and even then often inadequately. I believe that all the different methods of holding the bone by the inside splint, the coaptation suture which has been spoken of, should all be at hand when we operate. I always like to have an X-ray picture taken before the operation but I think that each one will agree that when we open a limb we find that the X-ray picture has only told part of the truth, even although taken in two planes, we often will find the uncovered bone shows conditions not represented in the radiograms as Dr. Stillman has found, that in one case we can use one thing and in the other case another, and we have to be familiar with all the methods and to have them at hand. The retention of these things in the leg afterwards, I think, depends entirely upon sepsis and asepsis. I think that something that I learned from Dr. Hunkin is applicable, that is with regard to too much handling of these things which go into the wound to remain. First they are handled by the operation nurses in laying them out on the instrument table and again by the nurse in handing them to you, by your own assistant and by yourself. The things which go into the limbs should never be touched by anybody but the operator himself, he should take them up and put them into the limb, that is what Dr. Hunkin began doing when he began to put in silk sutures in paralytic limbs. There is altogether too much general handling of instruments in our operating rooms. If we can succeed in getting through an operation practically with asepsis (no operation is absolutely so), only such infections going in as can be taken care of by the blood and tissues, almost any substance and any amount will stay. The transitory nature of this work is something we will all agree to. We have had to take out these staples in some instances and they always come out easily if one pulls them in the direction in which the points lie. I have always used screws, wire and staples except in one instance. In this man (exhibiting radiogram) whose femur was broken just above the condyles in a region where cancellous tissue made it impossible to use a screw or staple efficiently, I put on a wide band reaching from one fragment to the other like a ferrule. The fracture was already an old one when this was done, some callus had been thrown out and this had to be included in the band of ferrule. The band has, however, remained perfectly well in place, holding the alignment accurately; nor does it in any way interfere with function even although it is somewhat near the joint, and much of the callus has disappeared.

Dr. Huntington: I am much pleased at the interest elicited by this subject during the past three years. A comparatively short time has elapsed since frequent resort to the open method in fracture treatment has been seriously entertained. During a recent eastern trip, I was surprised to find how few hospital surgeons manifested a willingness to undertake this line of work. Urgent cases were operated upon without protest, but the idea of approximate reposition seemed to meet the ideals of most surgeons. The question has been asked many times by physicians remote from hospital facilities whether or not they should operate in obdurate cases. The answer is certainly NO.

There is always the alternative of sending such patients to a well equipped hospital, or if that be impossible, the surgeon should protect himself by making a plain statement to the effect that without an operation, a satisfactory result cannot be assured. With a written record of that, the surgeon is safe from subsequent attack. With regard to open fractures, my feeling is that there should be sufficient delay to warrant the presumption that the danger of sepsis is past. We must consider open fractures always as primarily infected and to introduce a new element in the shape of a foreign body under these circumstances is of questionable propriety.

MEDICAL ETHICS IN SAN FRANCISCO.

By W. S. THORNE, M. D., San Francisco.

The following article is a reprint, the original appearing seventeen years ago.

In view of the fact that the subject is one to which attention is constantly drawn by real or fancied transgression of ethical conduct, I venture to hope that the suggestions may not be inappropriate to the present day:

"In California, isolated from the older and more stable societies, the medical profession is characterized by an absence of that *l'esprit de corps* that we observe elsewhere. The explanation of the fact is to be found in the heterogeneous elements comprising the body of the medical profession. The transplanting of men, representing different nationalities, ideals and social conditions, and the consequences that follow the self-restraint and respect imposed upon the individual by the conventionalities of more ancient and crystallized societies, conduce to a diversity of thought and action which we are accustomed to witness here. Provincialism finds expression in self-laudation and an exaggerated idea of the especial superiority of country, educational advantage, and college degree. Nothing so pre-